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MEMOIRS

OF THE

GEOLOGICAL SURVEY

OF

THE UNITED KINGDOM.



BRITISH ORGANIC REMAINS.

DECADE I.-VI

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1849.

N O T I C E.

PALÆONTOLOGICAL researches forming so essential a part of geological investigations, such as those now in progress by the Geological Survey of the United Kingdom, the accompanying plates and descriptions of British Fossils have been prepared as part of the Geological Memoirs. They constitute a needful portion of the publications of the Geological Survey, and are taken from specimens in the public collections, or lent to the Survey by those anxious to advance this branch of the public service. Although numerous drawings had previously been made, and engravings from them considerably advanced, it was not thought expedient to commence their publication until the large collections of the Survey could be well examined, which a want of the needful space has, until the present time, considerably retarded. This impediment to progress is now being removed, and when the collections can be properly displayed in the New Museum of Practical Geology, in Jermyn Street, it is hoped that the public will have an opportunity of gradually obtaining, in a convenient manner and at small cost, a work illustrating some of the more important forms of animal and vegetable life there preserved, and which have been entombed during the lapse of geological time in the area occupied by the British islands.

The plan proposed to be followed in the work, of which the two Decades now published form a part, is as follows:—

To figure in elaborate detail, as completely as possible, a selection of fossils, illustrative of the genera and more remarkable species of all

classes of animals and plants the remains of which are contained in British rocks ; to select especially such as require an amount of illustration which, to be carried out by private enterprise, would require a large outlay of money, with little prospect of a return, and a long time to accomplish, but which, by means of the staff and appliances necessarily employed on the Geological Survey, can be effected at small cost, and with a rapidity demanded by the publication of the maps and memoirs of the Survey ; thus, it is hoped, affording an aid to those engaged in the sciences with which this work is connected, that they might not otherwise have possessed, and which may materially promote the progress of individual research.

H. T. DE LA BECHE,
Director-General.

Geological Survey Office,
24th May, 1849.

B R I T I S H F O S S I L S.

DECADE THE FIRST.

THE first Decade of representations of British Fossils is devoted to a selection of Echinoderms, of the Orders *Asteriadæ* and *Echinidæ*.

With the exception of the *Crinoideæ* and *Cystideæ*, no special monographs have been devoted to the illustration of our fossil species of Echinodermata, notwithstanding their acknowledged importance in a geological point of view. The majority of species found in British strata are unfigured in British works; a very great number are not figured at all, and those of which we possess British figures are, for the most part, delineated either imperfectly or insufficiently for the demands of science in its present state. This is the more remarkable since, for the description and delineation of numerous species, ample materials exist in collections.

Of the following plates, one is devoted to figures of all the Silurian star-fishes as yet discovered in British strata. None of these have hitherto been represented in any work. Their names only, accompanied by short descriptive characters, have appeared in the "Synopsis of British Fossil Asteriadæ," contained in the second part of the second volume of the "Memoirs of the Geological Survey of Great Britain." Some remarkable new forms of star-fishes from the Oolites, and all as yet discovered in the London clay, are figured in the second and third plates.

The fourth plate is devoted to a representation of the only fossil as yet discovered of the family *Euryales*, now for the first time described and figured, through the kind co-operation of the Rev. Professor Sedgwick.

In the six following plates a series of illustrations of the British fossil *Echinidæ* is commenced, of the majority of which, even the commonest and those most important for the identification of strata, no good representations are accessible to the student of English fossils. The importance of a knowledge of the members of this family to the explorers of oolitic and cretaceous strata cannot be too strongly insisted on, and their beauty and interest, in a purely Natural History point of view, render them admirable subjects for elaborate delineations.

When the collections accumulated during the course of the progress of the Geological Survey have been thoroughly examined and arranged, new light may be expected, bearing on the details of structure of the species now figured. Additions will consequently be made to the plates from time to time; and it is proposed to issue supplementary figures of the variations of form exhibited by the several species selected as subjects for these decades.

EDWARD FORBES.

May, 1849.

B R I T I S H F O S S I L S.

DECADE I. PLATE IV.

PROTASTER SEDGWICKII.

[Genus PROTASTER. FORBES. (Sub-kingdom Radiata. Class Echinodermata. Order Ophiuridæ. Family Euryales.) Body circular, covered with squamiform plates; genital openings in the angles of junction of the arms beneath; arms (simple) formed of alternating ossicula.]

SPECIES UNICA. *Protaster Sedgwickii.* FORBES.

The remarkable fossil, of which, through the co-operation of Professor Sedgwick, we are enabled to give a figure, is unique of its kind, and has a peculiar interest in being the only representative of the tribe *Euryales* as yet discovered in the fossil state. I refer it to that tribe, and not to the *Ophiuræ*, with which at first sight it might be confounded, on account of the alternation of the ossicula of the arms, a conformation of which the *Astrophyton* and other genera of the former group exhibit examples, whilst it is never seen in any genus, as yet discovered, of the latter division. Like many other Silurian fossils, this one affords but imperfect materials for an investigation zoologically of its characters; such, however, as are to be seen in the specimens hitherto procured, are sufficient to enable us to assert with certainty that it is distinct both generically and specifically from any known starfish, whether recent or fossil.

Description.—The specimen figured consists of tolerably preserved impressions of the upper and under side of the disk or body, and of portions of the arms. The disk is circular, and shaped like that of an *Ophiura*. The arms are five in number, very narrow, equidistant, and similar.

The upper and under surfaces of the disk were covered by small, similar, more or less regular, polygonal or crescentic plates, imbricated in scale-fashion, and having punctated surfaces. Those of the under side of the body are smaller and more regular than those of the upper. The mouth is central, and rather small in proportion to the disk. The buccal apparatus is composed of ten parts or processes, arranged in pairs; half of each springs from the origin of each arm in a diverging manner, and meets the corresponding half to form a lanceolate tooth-

like projection, deeply indenting the cavity of the mouth. Of how many separate ossicles each of the buccal processes was composed the specimen affords but very indistinct indication. They seem to affect a slightly falcate form at their extremities. The arms were composed of alternating somewhat quadrate ossicula, the sides of which were deeply indented superiorly, in order to form spiniferous crests. The spines were apparently short, and not equal in length to the length of an ossicle, obtuse, and few in a row. The under surfaces of the brachial ossicula were not indented laterally. The central portions of the upper surfaces of the brachial ossicles were hollowed out slightly, and the sutures between them deeply impressed. About twelve of the brachial ossicles were imbedded in the disk, and the parts of the dorsal surface of the latter, corresponding to the arms and central skeleton, do not present traces of scales, a feature seen in existing *Euryales*.

The dimensions of Professor Sedgwick's specimens are as follows :—

Breadth of disk, $0\frac{9}{12}$ ths inch.

Average breadth between the arms, $0\frac{1}{12}$ ths inch.

Breadth of an arm, at its junction with the body, $0\frac{1}{12}$ th inch.

Locality and Geological Horizon.—SILURIAN, from Ludlow rocks at Docker Park, near Kendal, Westmoreland (specimen figured), associated with Encrinites, and at Benson Knot, also near Kendal, in hard sandstones, full of characteristic Ludlow fossils. Collected by the Rev. Professor Sedgwick and Mr. John Ruthven.

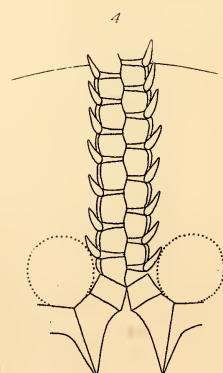
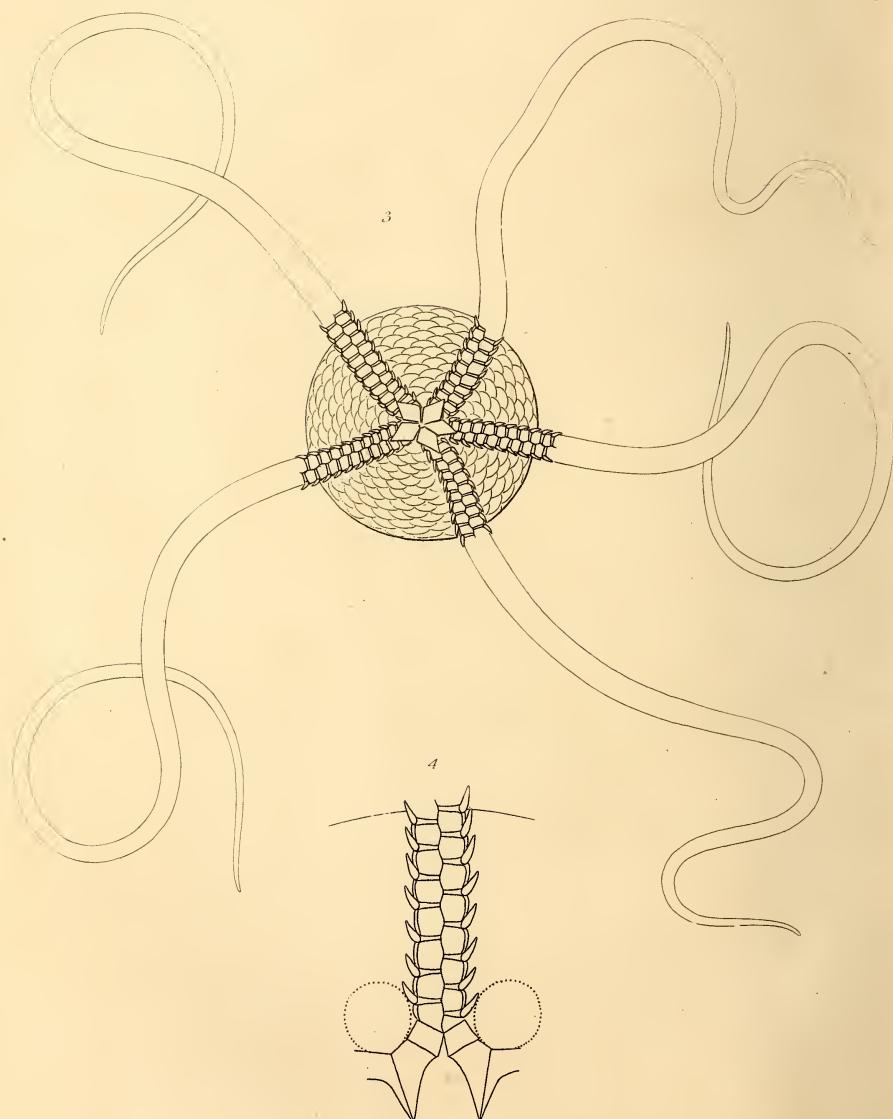
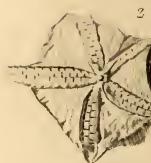
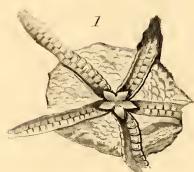
EXPLANATION OF THE PLATE.

Fig. 1, under, and Fig. 2, upper side of the Docker Park specimen. Fig. 3. Restoration to show the probable form and appearance of the animal. Fig. 4. Diagram of base of an arm, buccal processes, and position of ovarian openings.

EDWARD FORBES.

April, 1849.

Geological Survey of the United Kingdom.

PROTASTER
(Silurian)PROTASTER SEDGWICKII. *Forbes.*